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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/814,896  
Filing Date: March 31, 2004  
Appellant(s): SHAMBLEN ET AL.

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GROUP 1700

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Andrew L. Oltmans  
Registration No. 56,074  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed July 3, 2007 appealing from the Office action mailed March 7, 2007.

**I. Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**II. Related Appeals and Interferences**

The examiner is not aware of any related appeals, interference, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. Status of Claims**

The statement of the status of claims contained in the brief is correct.

**IV. Status of Amendments After Final**

The appellant's statement of the status of amendment after final rejection contained in the brief is correct.

**V. Summary of Claimed Subject Matter**

The appellant's statement of the summary of claimed subject matter contained in the brief is correct.

**VI. Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the ground of rejection to be reviewed on appeal contained in the brief is correct.

**VII. Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**VIII. Evidence Relied Upon**

JP 57-164958	Ishibachi et al.	10-1982
US 6,712,952 B1	Fray et al.	03-2004

US 5,958,106                   Amstrong et al.                   09-1999

US 6,926,754 B2                   Shamblen et al.                   08-2005

"Martensite and Martensitic Phase Transformation", University of Cambridge,

<http://www.msm.cam.ac.uk/phase-trans/2000/C9/lectures45.pdf>

### VIII. Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1, 2, 4-7, 9, 11, 12, 14-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Japanese patent 57-164958.

With respect to claims 1, 2, 4-6, 11, 12, 14, 21-23, JP '958 discloses (claim 1) a method for manufacturing a sintered high-alloy steel having a structure in which a fine carbide is uniformly dispersed in a martensitic iron alloy matrix, comprising:

mixing and pulverizing a compound metal oxide powder and carbon powder to form a compound mixture;

reducing said compound mixture in a hydrogen flow while being alloyed to obtain an alloy powder;

compacting and vacuum sintering said alloy powder;

compressing isotropically the sintered compact in an inert gas atmosphere;

heat-treating the compressed compact to render the matrix martensite.

JP '958 discloses in working example (1) (page 13) iron oxide is used as the precursor of the base metal and oxides of the alloying elements are used as the precursors of the alloying elements as in the instant claims 1, 4, 6 and 14.

JP '958 discloses that W, Mo, Cr, V, Co, Ti, Nb, Ta, C and N are used as alloying elements (2<sup>nd</sup> paragraph, page 7), which are the same as disclosed in the instant disclosure. In view of the identities of the materials and the method steps, it would reasonably appear that the recited thermophysical melt incompatibility and compatibility in the instant claims 1, 14, 5 and 23 would be inherent in the prior art. Appellant has not shown otherwise.

JP '958 discloses that the sintering temperature is generally 30° C to 70° C below the solid phase line (last paragraph, page 11); there is no liquid phase reaction from the creation of the alloy powder to the completion of the finished product. It is solid phase reaction all the way through to the end. (last paragraph, page 18). It would be inherently that the entire process of JP '958 to be performed without melting as in the instant claims 1 and 14.

With respect to claims 7 and 9, JP '958 discloses an amount of carbon for reducing the metal oxide as CO is added in powder form and heat is applied in a hydrogen flow to co-reduce the oxide with the hydrogen and carbon (claim 1). Because there is no melting in the entire process of JP '958 as discussed above, the reactions between said carbon powder and said metal oxide in JP '958 would be in solid state. The reduction of the metal oxide by a heated hydrogen flow in JP '958 would be vapor phase reduction.

With respect to claims 15 and 19 JP '958 discloses Mn is contained in the alloying elements as an impurity (last paragraph, page 13). It would be inherently that

the vapor pressure of Mn is about 10 times greater than that of base iron metal at a melt temperature and that Mn exhibits a miscibility gap with the iron base metal.

With respect to claim 16, JP '958 discloses that W, Mo and Ta are used as alloying elements (2<sup>nd</sup> paragraph, page 7), which are the same as disclosed in the instant disclosure. It would be inherently that the melting temperature of W, Mo and Ta are more than 400° C higher than that of iron.

With respect to claim 17, JP '958 discloses that Ta, W and Nb are used as alloying elements (2<sup>nd</sup> paragraph, page 7), which are the same as disclosed in the instant disclosure. It would be inherently that differences in density between Ta, W, Nb and base iron metal are greater than about 0.5 gram per cubic centimeter.

With respect to claim 18, JP '958 discloses that Ta is used as alloying elements (2<sup>nd</sup> paragraph, page 7). It would be inherently that Ta chemically reacts with the base iron metal in the liquid phase.

With regard to claim 20, JP '958 discloses the sintering is conducted in vacuum and the isotropical compression is conducted in an inert gas atmosphere (2<sup>nd</sup> paragraph, page 6). It would be inherently in the absence of evidence to the contrary that vacuum and inert gas atmosphere are used in JP '958's process to prevent the alloying elements, if melted, from chemically reacting with a melting atmosphere.

With respect to the microstructure features in the claims 1 and 14, JP ('958) discloses that the sintered high-alloy steel has a martensitic iron alloy matrix (claim 1). It has been well held where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or

substantially identical process, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977), MPEP 2112.01 [R-3] I. In the instant case, the sintered high-alloy steel of JP ('958) is produced by identical or substantially identical processes. The same microstructures and the same percentage of the microstructures having an acicular phase morphology as claimed in the instant claims 1 and 14 would be inherent in the sintered high-alloy steel of JP ('958) as in the claimed iron-based article.

2. Claims 13 and 24-26 are rejected under 35 U.S.C. 102(b) as being anticipated by JP ('958) as applied to the claims 1 and 14 above.

With respect to claim 13, JP ('958) discloses that carbides and/or nitrides can be added to the mixture prior to the consolidation step (1<sup>st</sup> paragraph, page 10, the translation).

With respect to the claims 24-26, JP ('958) discloses that Mn is present in the alloy powders (last paragraph, page 13) as claimed in the claim 26. It would be inherent that the vapor pressure of Mn is about 10 times greater than that of the iron-based metal at a melting temperature as claimed in the claim 24 and that Mn exhibits miscibility gap with the iron-based metal as claimed in the claim 25.

3. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP ('958) in view of Fray et al. (WO 99/64638 or US 6,712,952 B1).

JP '958 does not teach the reduction of the oxide with fused salt electrolysis.

Fray (WO '638) discloses a method to remove oxygen from metal oxides and solid solutions by electrolysis in a fused salt (abstract). It would be obvious to one of

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ordinary skill in the art at the time the invention was made to use fused salt electrolysis as disclosed by Fray (WO '638) in the process of JP '958 to reduce the cost for reduction and refining process as disclosed by Fray (WO '638) (col. 4, lines 23-25).

4. Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '958 and further in view of Armstrong et al. (US Patent No. 5,958,106).

With respect to claims 3 and 10, JP '958 does not teach using iron base metal and alloying elements in gaseous form as in the instant claim 3 and reducing the compound mixture by contacting with a liquid selected from the group consisting of a liquid alkali metal and a liquid alkaline earth metal as in the instant claim 10.

Armstrong et al. ('106) discloses a method of producing a non-metal element or a metal or an alloy thereof from a halide or mixtures thereof (abstract).

One of ordinary skill in the art would expect that when a metal halide is reduced, the metal in its gaseous form would be present in the vapor phase of the metal halide to be reduced. Therefore, examiner asserts in the absence of evidence to the contrary that using a metal halide implies using the metal in its gaseous form.

Armstrong et al. ('106) further discloses said method comprises providing a supply of halide vapor of the metal or non-metal or mixtures thereof, providing a supply of liquid alkali or alkaline earth metal or mixtures thereof, introducing the halide vapor submerged in the liquid alkali metal or alkaline earth metal or mixtures thereof at a velocity not less than the sonic velocity of the halide vapor to produce a powder of a non-metal or a metal or an alloy thereof and a halide of the alkali or alkaline earth metal by an exothermic reaction (claim 8). One of ordinary skill in the art would expect

that the vapor phase of the metal or non-metal or mixtures metal is in contact with the liquid alkali or alkaline earth metal or mixtures during the reaction.

It would be obvious to one of ordinary skill in the art at the time the invention was made to use halides of the base iron metal and alloying elements and reduce them by the process as disclosed by Armstrong et al. ('106) in the process of JP '958 in order to reduce the cost and environmental impact of the process as disclosed by Armstrong et al. ('106) (col. 2, lines 34-53).

5. Claims 1-4 and 6-9 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 5, 11, 12 and 13 of U.S. Patent No. 6,926, 754 B2.

Although the conflicting claims are not all identical, they are not patentably distinct from each other because:

With respect to instant claim 1, claim 1 of '754 B2 discloses a substantially similar process.

The instant claim 1 discloses a method for preparing an article of iron base metal alloyed with an alloying element, while '754 B2 claim 1 discloses a method for preparing an article of a base metal wherein the base metal is selected from a group consisting of nickel, cobalt, iron, iron-nickel and iron-nickel-cobalt (claim 1) alloyed with an alloying element. The two methods comprise identical steps. Examiner asserts that instant claim 1 would be in the scope of claim 1 of '754 B2.

With respect to instant claims 2-4, 6-9, they are identical to the claims 2-4, 5, 11, 12 and 13 of '754 B2 respectively.

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6. Claims 14-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 14-19 of U.S. Patent No. 6,926,754 B2 respectively in view of Martensite and Martensitic Phase Transformation, University of Cambridge, <http://www.msm.cam.ac.uk/phase-trans/2000/C9/lectures45.pdf>, 1<sup>st</sup> paragraph, page 1 ('UOC).

The instant claim 14 is identical to the instant claim 1 except for one additional step to prepare an article made of iron base alloyed with an alloying element – post-processing the consolidated metallic article by heat-treating the consolidated metallic article to form a martensitic steel. However, this would have been obvious to one of ordinary skill in the art at the time the instant invention was made to heat-treat the consolidated iron based metallic article in claim 1 of '754 B2 in order to form a martensitic steel with an outstanding combination of strength and toughness for the article as disclosed by 'UOC.

With respect to instant claim 20, it corresponds to the claim 19 of '754 B2.

With respect to instant claims 15-19, they are substantially similar to the claims 14-18 of '754 B2 respectively.

7. Claims 5, 11 and 12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of '754 B2 in view of JP '958.

JP '958 is further applied to the claimed limitations in the instant claims 5, 11 and 12 for the same reasons as disclosed in the grounds of rejection 1 above.

8. Claim 10 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of '754 B2 in view of JP '958 and further in view of Armstrong et al. ('106).

JP '958 in view of Armstrong et al. ('106) is further applied to the instant claim 10 for the same reasons as disclosed in the grounds of rejection 4 above.

9. Claims 21-23 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of '754 B2 in view of UOC and further in view of JP '958.

JP '958 is further applied to the claimed limitations in the instant claims 21-23 for the same reasons as disclosed in the grounds of rejection 1 above.

10. Claim 13 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims 1 of US ('754 B2) in view of JP ('958).

JP ('958) is further applied to the claimed limitations in the instant claim 13 for the same reasons as disclosed in the grounds of rejection 1 above.

11. Claims 24-26 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims 1 of US ('754 B2) in view of JP ('958).

JP ('958) is further applied to the claimed limitations in the instant claims 24-26 for the same reasons as disclosed in the grounds of rejection 1 above.

#### **X. Response to Argument**

The appellant's arguments in the Appeal Brief filed on July 3, 2007 have been fully considered, but they are not persuasive.

1. With respect to grounds of rejection 1, first, the appellant argues that JP ('958) does not disclose the claimed microstructures as claimed in claims 1 and 14. In response, as stated above, JP ('958) discloses that the sintered high-alloy steel has a martensitic iron alloy matrix (claim 1). It has been well held where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical process, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977), MPEP 2112.01 [R-3] I. In the instant case, the sintered high-alloy steel of JP ('958) and the claimed iron based metal alloy are identical or substantially identical in composition and are produced by identical or substantially identical processes. The same microstructures and the same percentage of the microstructures having an acicular phase morphology as claimed in the instant claims 1 and 14 would be inherent in the sintered high-alloy steel of JP ('958) as in the claimed iron-based alloy. There is no factual evidence in the record supporting appellant's assertion: "the Figures 1-2 of JP ('958), which depict the structure resulting from the Example 1 of JP ('958), do not evidence the recited acicular microstructure, and in fact show something quite different". Therefore, the appellant's assertion is merely an appellant's argument.

Second, the appellant argues that JP ('958) does not disclose chemically reducing the compound by vapor-phase reduction as claimed in claim 9. In response, as stated above, JP '958 discloses an amount of carbon for reducing the metal oxide as CO is added in powder form and heat is applied in a hydrogen flow to co-reduce the

oxide with the hydrogen and carbon (claim 1). Because there is no melting in the entire process of JP '958 as discussed above, the reactions between said carbon powder and said metal oxide in JP '958 would be in solid state. The reduction of the metal oxide by a heated hydrogen flow in JP '958 would be vapor phase reduction.

Third, the appellant argues that JP ('958) does not disclose that the alloying element has a vapor pressure of greater than about 10 times a vapor pressure of the iron base metal in a melt of the iron base metal and the alloying element exhibits a miscibility gap with the iron base metal in the liquid state as claimed in claims 15 and 19 respectively. In response, as stated above, JP '958 discloses Mn is contained in the alloying elements as an impurity (last paragraph, page 13). It would be inherently that the vapor pressure of Mn is about 10 times greater than that of base iron metal at a melt temperature and that Mn exhibits a miscibility gap with the iron base metal.

Fourth, the appellant argues that JP ('958) does not disclose the alloying element, if melted, chemically reacts with the crucible material or a melting atmosphere as claimed in claim 20. In response, as stated above, JP '958 discloses the sintering is conducted in vacuum and the isotropical compression is conducted in an inert gas atmosphere (2<sup>nd</sup> paragraph, page 6). It would be inherently in the absence of evidence to the contrary that vacuum and inert gas atmosphere are used in JP '958's process to prevent the alloying elements, if melted, from chemically reacting with a melting atmosphere.

Fifth, the appellant argues that JP ('958) does not disclose chemically reducing the compound mixture to produce the metallic alloy in the form of a spongy mass as

claimed in claim 22. In response, JP '958 discloses reducing the compound mixture in the form of preformed pallets (paragraph bridging pages 13 and 14, translation), which would inherently produce the metallic alloy in the form of a spongy mass as claimed.

2. With respect to grounds of rejection 2, first, the appellant argues that the carbide and nitride of JP ('958) do not meet the definition of the claimed "an other additive constituent" in claim 13 as defined in the instant specification. In response, the examiner notes the carbide and nitride of JP ('958) read on the "already reacted, substantially inert compound" as defined in the instant specification (paragraph [0061]) for the claimed "an other additive constituent".

Second, the appellant argues that JP ('958) does not disclose the presence of a precursor compound of manganese. In response, as stated in the Advisory Action dated June 4, 2007, that the manganese in the iron oxide of JP ('958) would very likely be in the forms of manganese oxide, manganese sulfide and a compound of manganese and iron.

3. With respect to grounds of rejection 3, first, the appellant argues that there is no objective basis set forth in the Office action of October 19, 2006 in the rejection of claim 8. In response, as stated above, it is noted that the motivation to combine the processes of JP ('958) and Fray et al. (WO 99/64638) is stated clearly in the Office action as to reduce the cost for reduction and refining process as disclosed by Fray et al. (WO '638) (col. 4, lines 23-25 of US 6,712,952 B1 which is in the patent family of Fray et al. (WO '638)).

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Second, the appellant argues that nothing in JP ('958) and Fray et al. (WO '638 or US 952 B1) suggests that the approach of Fray et al. (WO '638 or US 952 B1) would be operable and successful with the iron-based alloys of JP ('958). In response, as stated above, the USPTO does not have the equipment and the capability required to test the combination. The expectation of the success based on the success of the approach of Fray et al (WO '638 or US 952 B1) on similar oxides is reasonable and sound.

Third, the appellant argues that neither JP ('958) nor Fray et al. (WO '638 or US 952 B1) teaches that a "compound mixture" having an iron base metal precursor may be chemically reduced by fused salt electrolysis. In response, as stated above, the examiner notes that the rejection was based on the prior art's broad disclosure rather than preferred embodiments. See MPEP 2123. Fray et al. (WO '638 or US 952 B1) disclose that the invention may be used to remove the oxygen from a metal oxide. If a mixture of oxides is used, the cathodic reduction of the oxides will cause an alloy to form (col. 4, lines 18-22).

4. With respect to grounds of rejection 4, first, the appellant argues that there is no objective basis set forth in the Office action in the rejection of claims 3 and 10. In response, as stated above, it is noted the motivation to combine the processes of JP ('958) and Armstrong et al. ('106) is clearly stated in the Office action as to reduce the cost and environmental impact of the process as disclosed by Armstrong et al. ('106) (col. 2, lines 34-53).

Second, the appellant argues that nothing in JP ('958) and Armstrong et al. ('016) suggests that the approach of Armstrong et al. ('016) would be operable and successful with the iron-base alloys of JP ('958). In response, see the response to the similar arguments in the paragraph above.

Third, the appellant argues that neither JP ('958) nor Armstrong et al. ('016) suggests that a precursor compound for the base iron metal may be provided in a gaseous form. In response, as stated above, the examiner notes that the rejection was based on the prior art's broad disclosure rather than preferred embodiments. See MPEP 2123. Armstrong et al. ('016) disclose that the invention is to provide a method and a system to produce metals (which would include iron) and non-metals from the exothermic reduction of the halides (reacted in a gaseous form) (col. 2, lines 43-47).

5. With respect to grounds of rejection 5-11, the appellant argues that '754 B2 is not properly applied in the rejections, as it teaches directly away from the approach of the instant invention by teaching a method for making a superalloy, which as defined in the specification of '754 B2 has a continuous matrix phase with a face-centered cubic crystal structure, which is directly contrary to the body-centered cubic or body-centered tetragonal crystal structure of the instant invention. In response, the examiner notes that iron which is the base metal of the instant disclosure is indeed in the Murkush group of the base metals of '754 B2. The nonstatutory obvious type double patenting rejection is based on the legal standards that the conflicting claims are not identical, but at least one instant claim is not patentably distinct from the claim(s) of the US ('754 B20) because the instant claim is either anticipated by, or would have been obvious over the

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claim(s) of US ('754 B20). Both articles of '754 B2 and the instant application are iron-based alloys and are produced by identical or substantially identical processes. A prima facie case of either anticipation or obviousness has been established. See MPEP 2112.01. The same microstructures and the same percentage of the microstructures having an acicular phase morphology as claimed in the instant claims 1 and 14 would be inherent in the article of US ('754 B2) as in the claimed article.

#### **XI. Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and interferences section of the examiner's answer.

For the above reasons, it is believed that rejections should be sustained.

Respectively submitted,

Weiping Zhu

*Zhu, Weiping*

*Roy King*

Roy King

ROY KING  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700

Appeal Specialist

*Romulo Delmendo*  
Romulo Delmendo